Predicting Kindergarten Success with

Developmental and Cognitive Variables

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First experiences in school often set the tone for later school

success, so it is important that these experiences be positive.

Children who are "ready" for school are more likely to succeed since

they have the prerequisite skills to participate successfully in the

various activities of the classroom. For example, research on the

effects of early training indicated that maturation is a key factor

in learning (e.g., Dennis & Dennis, 1935) and that children who were

maturationally ready learned more quickly and efficiently than those

children attempting the same task but not ready developmentally.

Since that time, Gesell and his associates (Ilg, Ames, & Apell, 1965)

have conducted several studies in which they demonstrated that matura-

tion (i.e., developmental variables) is a key factor in determining

whether a child is able to benefit from the learning experiences pro-

vided by the school. Gesell's work led to the development of the

Gesell Readiness Test, which assesses how the child is behaving as a

whole organism, using a developmental or maturational perspective.

Physical development variables, such as motor skills, eye-hand coordi-

nation, and dentition have also been identified as indicators of

school readiness (e.g., Ames, 1967; Ames & Ilg, 1964; Brenner, 1957;

Harrison, 1981; and Ilg, et al., 1978). Thus, from a developmental

point of view, a child is ready for school when s/he has reached a

particular level of maturation.

Readiness has been defined more broadly than maturational level only, including emotionally (Does the child become very upset about separation from the parent?), physically, in particular perceptual motor and fine motor skills, socially (Can s/he interact with peers and other (non-family) adults?), and intellectually (Does the child have the necessary cognitive skills to benefit from the curriculum of the school?). Yet these components can be collapsed into two broad categories: developmental and cognitive, with the developmental encompassing the first three.

The cognitive aspects of school readiness emphasize problem solving and an active interaction with the environment. Variables here include vocabulary, language usage, the use of experience in solving problems, and thinking. Research has demonstrated that cognitive development is related to first grade achievement (e.g., Bell & Aftanas, 1972; Kaufman & Kaufman, 1972). Up to the mid-fifties, the primary emphasis in kindergarten was developmental (i.e., getting "ready" for the cognitive activities of the first grade). Since the surge of interest in Piaget's work in the early sixties, many kinder-garten programs have taken a more cognitive orientation (Kulberg & Gershman, 1973). Following this cognitive tradition, an increasing number of schools are offering academic kindergartens where reading, writing skills, arithmetic, and foreign languages are offered in addition to social and emotional developmental activities.

Measures for preschool and kindergarten children likewise reflect these two orientations. However, both Jensen (1969) and Chisson (1971) point out that cognitive readiness must have accompanying motor

and physical readiness. Measures used in the past to predict kinder-garten success or readiness for first grade, such as the Gesell Readiness Test which emphasizes developmental variables, may no longer be effective predictors, particularly when success has been redefined along more cognitive lines. Therefore, a combination of both cognitive and developmental tasks is necessary.

Since all children must attend school, why is it important to determine readiness for kindergarten? Not all children should attend an academically oriented kindergarten, and only those who have a rela-tively good chance of success should be admitted. Admitting those children who have a high probability of failing is a disservice to those children, since research has indicated that a positive self concept is related to school achievement or school success (e.g., Caplin, 1969; Hebert, 1968; and Purkey, 1970), and conversely, that continued failure may lead to poor feelings about oneself and a sense of fatalism. Feeling successful in school can also help one feel good about oneself in general. Failure experiences can be devastating to a young child particularly one who has seldom been in competitive situa-tions. Feeling good about oneself and being successful in one's activities have been found to contribute to positive mental health. Therefore, identifying those children who are ready to participate in an academic kindergarten is important to the child and the parent as well as to the school.

Readiness. For the purpose of the present study, readiness is defined as being capable of benefiting from learning experiences available in an academic kindergarten such that each child scores at

the seventh stanine or above on the Stanford Early School Achievement Test (SESAT). Thus, both cognitive and developmental skills are necessary. This cut-off score, as well as the test itself, was selected by the school.

The purpose of the present study was to identify potential predictors of success in an academically oriented kindergarten, using both cognitive and developmental variables. Once a set of validated predictive variables is identified, these will be used as an admissions measure to the academic kindergarten program so that children who have a high probability of failing in the program can be counseled to consider other options. At the present time, children are admitted on the basis of place on a waiting list, or of having a sibling in a higher grade. There is currently no procedure being used to identify children who should be encouraged to wait a year to start school, or to consider a less academically-oriented, competitive situation.

Sample. The sample consisted of all 44 children applying for admission to an academic kindergarten of a local private school. Since the measures were being evaluated as potential admissions criteria, all children were admitted regardless of their performance on these measures. The mean age of the children at the time of testing was 58.23 months (s = 4.12). Since these children were attending a private school and the generalizability of the results may be questioned, their SESAT scores were compared with those of the national norming sample as reported in the test manual (Madden & Gardner, 1969). The children in the present sample scored significantly higher than those in the norming sample. Therefore, results may be limited in generalizability to some extent. However, Chisson (1971) and Kulberg and Gershman

120

(1973) report similar findings, so that even though the results of the present study are based on a limited sample, they do replicate results found in the literature.

Instrumentation. Four measures were administered to all children during the spring preceding their admission to kindergarten the next fall. These included the Dallas Developmental Scale, a set of tasks divided into five scales: Psychological, Visual, Language, Auditory, and Motor. Tasks included communications, listening, vocabulary concepts, memory, and ability to match designs. The Frostig Developmental Test of Visual Perception consists of five subtests entitled Eye-Hand Motor Coordination, Figure Ground, Form Constancy, Position in Space, and Spatial Relations. Together, these subtests measure visuomotor coordination, visual perception, and spatial relations. The Monroe Visual Test measures visual perceptions in terms of the child's ability to match geometric shapes. The fourth measure was the Gesell Readiness Test, consisting of developmental tasks in the areas of motor skills and adaptive behavior, and the cognitive area of language. Four of the five Dallas scales measure cognitive aspects of school readiness, as does the spatial relations and position in space scales of the Frostig, the Monroe Visual Test, and the language scale of the Gesell. Other subtests of the Frostig and the Gesell Readiness Test are composed of developmental tasks rather than cognitive ones, as is the Dallas Motor Scale.

The four tests were chosen to represent the cognitive and developmental areas of readiness. The Gesell Readiness Test was selected since research indicates it does relate to first grade achievement

121

(e.g., Kaufman & Kaufman, 1972). The Frostig measure was included based on previous research (e.g., Maslow, et al., 1964; Ohnmacht & Olson, 1968; and Morency & Wepman, 1973), as well as the skills that were measured: the fine motor coordination necessary to hold a pencil to learn to write, and the perceptual abilities necessary to distinguish letters and numbers. The Monroe Visual Test was included, since it has been found to be related to early reading skills (Morency & Wepman, 1973). The Dallas Developmental Scale is a research measure, developed by the Dallas Independent School District which incorporates both developmental and cognitive variables. It has been shown to be related to first grade success. The emphasis on the combination of developmental and cognitive variables is also reflected in the work of Piaget (e.g., Ginsburg & Opper, 1969), but at the present time no preschool scale is available based on Piaget's theory. (Various tasks may be "put together" to assess aspects of a child's capacities, but scaling and norm data are not available.)

The subtest and total scores from the SESAT, given during the spring of the kindergarten year, were used as dependent variables.

Procedure. During the month of April prior to kindergarten entry, children were brought to the school by their parents. The group of tests were given in a quiet room at the school by a trained examiner. The child was encouraged to come to the testing room alone; however, parents were allowed to accompany the child if it appeared that the child would be upset by leaving the parent. After the testing session the child was given a tour of the kindergarten facilities and met the kindergarten teacher.

Results

Results are presented for the SESAT as the dependent variable, and the efficacy of the developmental and cognitive predictors for this measure is evaluated. Recommendations for further study are also made.

The SESAT consists of four subtests, plus the total score. The best set of predictors for each subtest, as well as for the total score, was sought. Subtest 1 is entitled Environment, and contains items from both the social and natural sciences. The test is designed to measure the child's ability to organize experiences in school as well as out of school in relating to the environment. As presented in Table 1, six variables were found to be significant predictors for this subtest, yielding an R = .67 (p = .004). Four of these variables are cognitive (Monroe, Frostig Spatial Relations, Frostig Position in Space, and Dallas Visual); the remaining two are developmental (Gesell Adaptive and Gesell Motor).

Table 1

Prediction of Stanford Subtest 1
Environment

Predictor	p to enter	simple r	R	significance
Monroe Visual	.004	.46	.46	.004
Adaptive-Gesell	.084	-.01	.53	.004
Motor-Gesell	.150	-.17	.57	.004
Spatial Relations Frostig	.142	.32	.61	.004
Visual-Dallas	.122	.07	.65	.004
Position in Space Frostig	.191	.02	.67	.004

The second subtest is Mathematics, and measures concepts of conservation of number, space, and volume; counting, measurement, numeration and classification. For this subtest, only one variable entered into the stepwise analysis with an alpha less than .30. The Monroe correlated .25 with the score on this subtest (p = .132). Thus, none of the independent variables are significant predictors of this subtest.

Letters and Sounds is the third subtest, and measures both the ability to recognize upper and lower case letters, as well as the auditory perception of beginning sounds. As indicated in Table 2, five variables yielded an R = .59 (p = .015). Four of these variables are cognitive (Dallas Visual, Dallas Auditory, Dallas Psychological, and Gesell Language) and the remaining one is developmental.

Table 2

Prediction of Stanford Subtest 3
Letters and Sounds

Predictor	p to enter	simple r	R	significance
Visual-Dallas	.064	.31	.31	.064
Auditory-Dallas	.106	-.17	.40	.049
Psychological- Dallas	.066	.24	.49	.024
Language-Gesell	.143	-.17	.54	.021
Form Constancy- Frostig	.105	.22	.59	.015

The fourth subtest of the SESAT is Aural Comprehension, which measures the child's abilities to pay attention, organize, interpret,

and remember what s/he has heard. Table 3 presents the results of this analysis, which indicates three variables yielded an R = .61 (p = .002). Again, the majority of the variables are cognitive.

Table 3

Prediction of Stanford Subtest 4
Aural Comprehension

Predictor	p to enter	simple r	R	significance
Psychological-Dallas	.001	.53	.53	.001
Form Constancy-Frostig	.088	.21	.58	.001
Monroe Visual	.223	.34	.61	.002

The total score from the SESAT was also used as a dependent variable, since it is this score that is used as an admissions requirement for the first grade. As indicated in Table 4, three variables yielded an R = .60 (p = .002); all three variables are cognitive.

Table 4

Prediction of Stanford Total Score

Predictor	p to enter	simple r	R	significance
Monroe Visual	.004	.46		.004
Psychological-Dallas	.019	.44		.001
Auditory-Dallas	.203	.03		.002

Table 5 presents a summary of the significant predictors to aid in interpreting the variety of analyses presented here. It also becomes quite apparent that although the cognitive variables are quite important as predictors of kindergarten success, the developmental variables also account for some of the unique variance.

Table 5

Summary of Predictors

| | Stanford Early Achievement Test | | | | | Total |
	1	2	3	4	Total Score	Number
Dallas						
Visual	X		X			2
Auditory			X		X	2
Psychological			X	X	X	3
Language						
Motor						
Frostig						
Form Constancy			X	X		2
Eye-Hand Motor						
Figure Ground						
Position in Space	X					1
Spatial Relations	X					1
Gesell						
Adaptive	X					1
Motor	X					1
Language			X			1
Monroe Visual	X			X	X	3

X denotes a significant predictor for a particular combination of dependent and independent variables. Refer to Tables 1-4 for specific contributions to explained variance.

Discussion

The results of this study indicate that although cognitive variables account for a greater proportion of the variance in predicting the scores on the end-of-kindergarten achievement test, developmental variables also contribute some unique variance. Children who enter kindergarten with a high level of cognitive skills tend to perform better both in kindergarten as well as on the end of kindergarten achievement test. Although past research (e.g., Ilg, et al., 1978) has suggested that developmental tasks are good predictors of success in kindergarten, the present study has shown that for an academically oriented kindergarten, measures of cognitive skills are better predictors of kindergarten success.

Four sets of measures were administered to the children prior to the beginning of kindergarten. Of the four measures, two, the Dallas Developmental Scale and the Monroe Visual Test, are worthy of further study. In particular, the four cognitive subtests of the Dallas predicted a greater number of the dependent variables than the other measures used. However, it should be noted that subtest 2 of the SESAT, the Mathematics Test, did not have any significant predictors. Therefore, further exploration must be done before an expectancy table can be developed for use in the admissions process.

Both the Frostig Developmental Test of Visual Perception and the Gesell Readiness Test predicted so few of the subtests that they should be replaced in the battery of tests to be administered to the next kindergarten class. It is interesting to note that both of these measures have been found useful in other contexts in predicting early

127

school success. For example, Kaufman and Kaufman (1972) obtained an r of .64 with the Gesell tests and the Stanford Achievement Test administered at the end of first grade, and the Frostig was found to be related to the ability to learn to read during first grade (Maslow, et al., 1963).

Multiple R's are in the upper .50's and low .60's for the end of kindergarten measure; therefore, predictions over a twelve-month period were fairly high, indicating that these are useful measures for further exploration as a kindergarten admissions battery. Children applying to the academic kindergarten program are usually of moderate to high ability levels, indicating that a restriction in range exists in these R's (most of the children did score at or above the seventh stanine, although some did not). With this in mind the observed efficacy of the predictors is even more important.

Identifying children at risk of doing poorly in an academic kindergarten is important to the child as well as to the parents. Children who do poorly in their first school experiences are likely to experience lower self concepts, and lower achievement levels in school later (e.g., Purkey, 1970). However, if they were to enroll in a more traditional kindergarten, one without the strong academic emphasis, they probably would experience success. Therefore, using an admissions test that will identify children at risk of failure will be particularly beneficial to the children who do not belong in an academic kindergarten, but who will probably succeed in a traditional kindergarten and first grade. Although the set of predictors yielded reasonably good multiple R's over the twelve-month period, no significant predictors were found for

subtest 2, Mathematics. Therefore, work msut be continued in the development of the admissions test battery.

Summary

Assessing the relative efficiency of the developmental versus cognitive variables in predicting success in an academic kindergarten is an important first step in developing kindergarten admissions measures. The purpose of the study was to administer a set of developmental and cognitive variables to predict kindergarten success, as defined by earning a score at or above the seventh stanine on the SESAT. Subjects were all 44 children who had applied for admission to an academic kindergarten class. Results indicated that although fairly high multiple R's were obtained, one of the subtests of the SESAT had no significant predictors. Therefore, other measures must be evaluated before an admissions test can be implemented for identifying children at risk of failure in an academic kindergarten program.

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